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A NEW SPECIES OF *COPTOPSYLLA* JORDAN AND ROTHSCHILD, 1908, FROM NORTHERN SAUDI ARABIA WITH COMMENTS AND A KEY TO THE GENUS (SIPHONAPTERA : COPTOPSYLLIDAE)[1,2]

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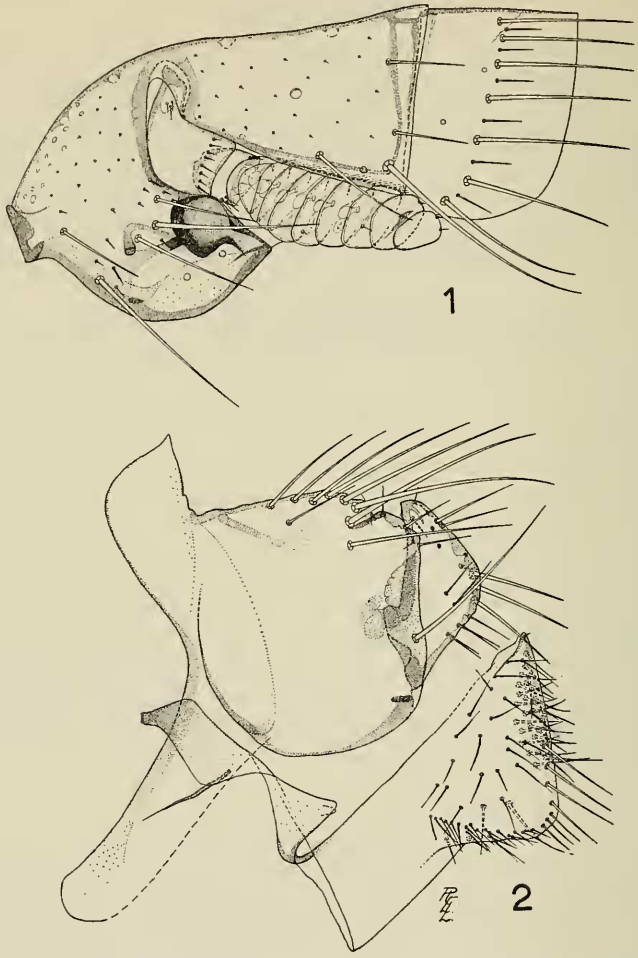
The Trans-Arabian Pipeline Company recently made it possible for me to conduct a limited flea survey on and near their four major pumping stations at Turaif, Badanah, Rafha and Qaisumah, Saudi Arabia. Detailed reports of the fleas (Lewis, 1964) and mammalian hosts (Lewis, Lewis and Harrison, in press) are appearing elsewhere. Specimens of a new species of flea belonging to the genus *Coptopsylla* J. and R., 1908, were collected during the trips and due to the additions to our knowledge of the genus since the appearance of the publications by Ioff (1953) and Hopkins and Rothschild (1956) it seems desirable not only to describe the species but also to review the recent literature.

Coptopsylla joannae, new species

Diagnosis: Near *Coptopsylla bairamaliensis* Wagner, 1928, from which it differs in the male in the following points: a) body bristles not particularly coarse; b) L^2 of fixed process nearly as broad as in *bairamaliensis* but lacking the conspicuous caudal angle of that species; c) movable process triangular, only 2½ times as long as wide; d) apical portion of St. IX triangular, heavily setose on both dorsal and ventral margins, but less so than in *C. bairamaliensis*. In the female, *C. joannae* differs from *C. bairamaliensis* in the following points: a) St. VII with apical margin almost straight; b) bulgae of spermathecae globular, not very angular; c) hilla 1¼ times the length of the bulga; d) lower antepygidial seta 2½ times as long as the upper.

[1] Publication number 7 of the American University of Beirut Museum of Natural History.

[2] Portions of this work were supported by an Arts and Sciences Rockefeller Research Grant.



FIGS. 1–2. *Coptopsylla joannae* n. sp. 1, Head of holotype ♂. 2, Modified abdominal segments of holotype ♂.

Description: HEAD (Fig. 1, male)—Clypeus well developed, strongly sclerotized. Ventral region of frons not strongly sclerotized, with numerous microsetae. Gena ventrally markedly convex. Eye ovoid, heavily pigmented. Antennal fossa open nearly to its dorsal margin, with a row of small setae extending along its dorsal margin nearly the entire length of the clava. First antennal segment with a proximal patch of 3 (rarely 1, occasionally 2) small setae and a distal row of 8 (5 to 9) slightly longer ones. Ocular row composed of three large and one or two small setae.

Preocular row consistently of two large setae: one arising near the base of the clypeus, the other before and above the eye. Occipital row of three setae per side, the lowest being 2½ to 3 times as long as the remaining two. One preoccipital seta present, arising near dorsal margin of the antennal fossa. Maxillary palpi extending to middle of fore trochanter. Maxillary stipes barely as long as basal segment of labial palpi. Labial palpi 5-segmented. One seta of segment 1 longer than segment 2; 1 seta of segment 2 longer than segment 3; no setae of segments 3 and 4 longer than the following segment. The whole of segment 5 extending past distal margin of the trochanter.

Thorax—Pronotum on each side with one row of 7 (6 in three of ten males) large setae, mesonotum with one row of 6 (5 in three males) large setae, metanotum with one row of 5 to 7 large setae. Lateral metanotal area distinct, with two large setae arising in the center. Mesosternosome with 5 large setae. Metepisternum with a single seta near its dorsal apex. Metepimeron with 5 large setae, 2 in the prespiracular row and 3 in the spiracular row.

Legs (Prothorax)—Anterior margin of prothoracic coxae devoid of setae except for two which protect the coxal-trochanteral joint. Posterior border with 3 or 4 setae on the dorsal margin and a pair of larger ones on the caudo-apical angle. Between these two setae projects a small, papillate extension of the coxal margin in both sexes. Below it the apex of the coxa extends ventrad forming a flap which almost completely covers the trochanter. The inner surface of this flap bears a horizontal row of 4 minute setae. Outer surface of coxa with 12 to 14 setae of variable size. Inner surface without setae. Femur with 2 setae on inner surface and 7 setae on outer surface arranged in two diagonal transverse rows in addition to the setae of the dorsal margin. Tarsal segment V with six pairs of lateral plantar bristles and two pairs of subapical plantar bristles in ten males, six pairs of lateral plantar bristles and one pair of subapical plantar bristles in fourteen females (one specimen had an additional subapical plantar bristle on one side).

(Mesothorax)—Setae of mesothoracic coxae restricted to anterior margin and apex; about 10 in number. Nine to 11 small setae along dorsal margin of the femur with three smaller submarginal setae below them on the outer surface. No other vestiture on outer surface of femur except 3 or 4 setae which are situated near the ventral margin on the distal half of the segment. Inner surface of the femur lined with a row of about 6 to 8 setae distributed longitudinally near the ventral margin. Caudal margin of tibia with seven indentations including apical notch. Each notch except numbers 5 and 7 bears two strong setae while 5 and 7 possess three strong setae. Outer surface with a longitudinal row of 4 smaller setae. Inner surface bare. Tarsal segment I slightly shorter than segment II. Segment II slightly shorter than segments III and IV combined. One apical seta of segment II extending to apex of segment III. Segment V with six pairs of lateral plantar bristles and two pairs of

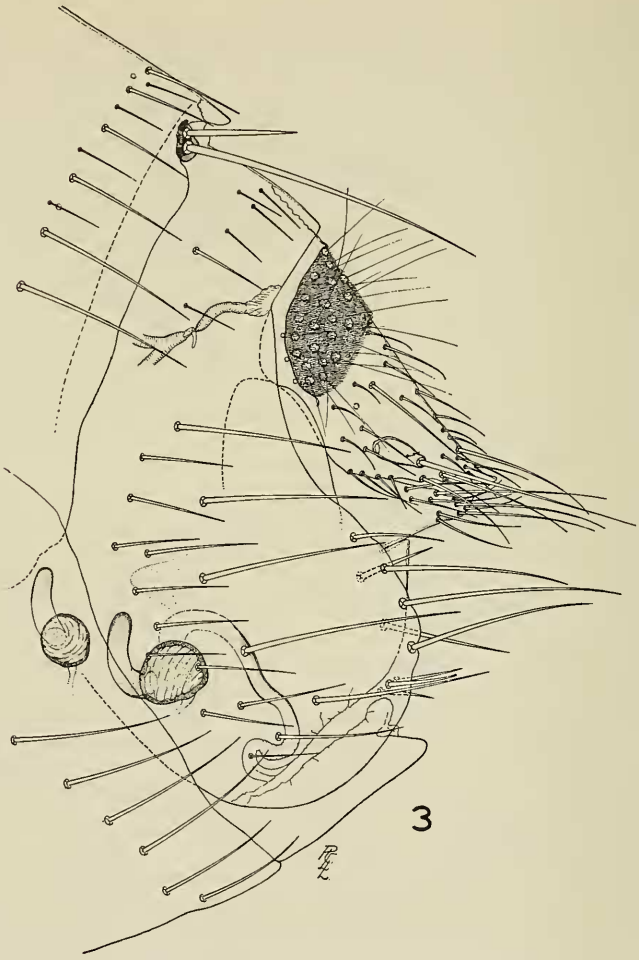
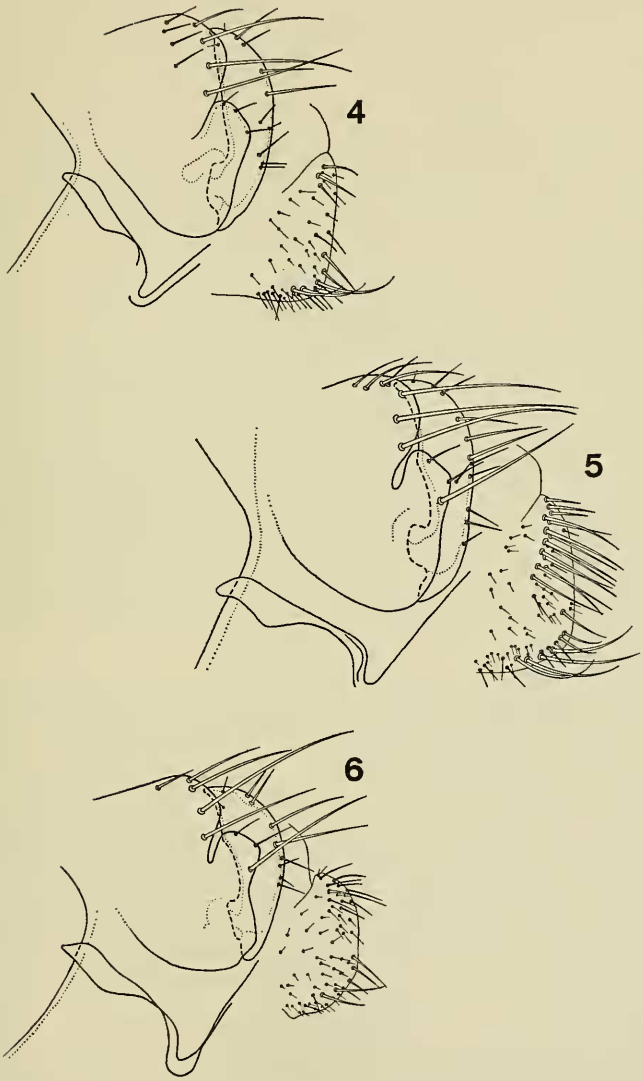


FIG. 3. *Coptopsylla joannae* n. sp. Modified abdominal segments of allotype ♀.

subapical plantar bristles (one and one-half [3] in 20%) in the males; six pairs of lateral plantar bristles and one pair of subapical plantar bristles in the females.

(Metathorax)—Setae of metathoracic coxae also restricted to anterior margin and apex; about 13 in number. In addition the mesal surface bears a vertical row of 4 or 5 submarginal setae. Twelve to 14 small setae along dorsal margin of femur with three smaller submarginal setae below them on the outer surface. Three additional setae near the ventral



Figs. 4–6. *Coptopsylla lamellifer.* 4, *C. l. lamellifer* (Wagner, 1895) redrawn from Ioff, 1953. 5, *C. l. rostrata* Ioff and Tiflov, 1934, redrawn from Ioff, 1953. 6, *C. l. ardua* Jordan and Rothschild, 1915, redrawn from Ioff, 1953.

margin on the distal half of the femur. Inner surface of the femur lined with a longitudinal row of ten setae near the ventral margin. Tarsal segment I 1½ times as long as segment II; segment II slightly longer than segments III and IV combined. At least one long bristle of segment I extending to apex of segment II; two long bristles of segment II extending past the tip of segment V. Tarsal segment V with six pairs of lateral plantar bristles and one pair of subapical plantar bristles in the males. Of 14 females all but one have six pairs of lateral plantar bristles (the exception possesses 6 pairs on one tarsus and 5½ pairs on the other). While 11 females have one pair of subapical plantar bristles, one specimen has but one on each tarsus and two more lack one bristle of the pair on one tarsus.

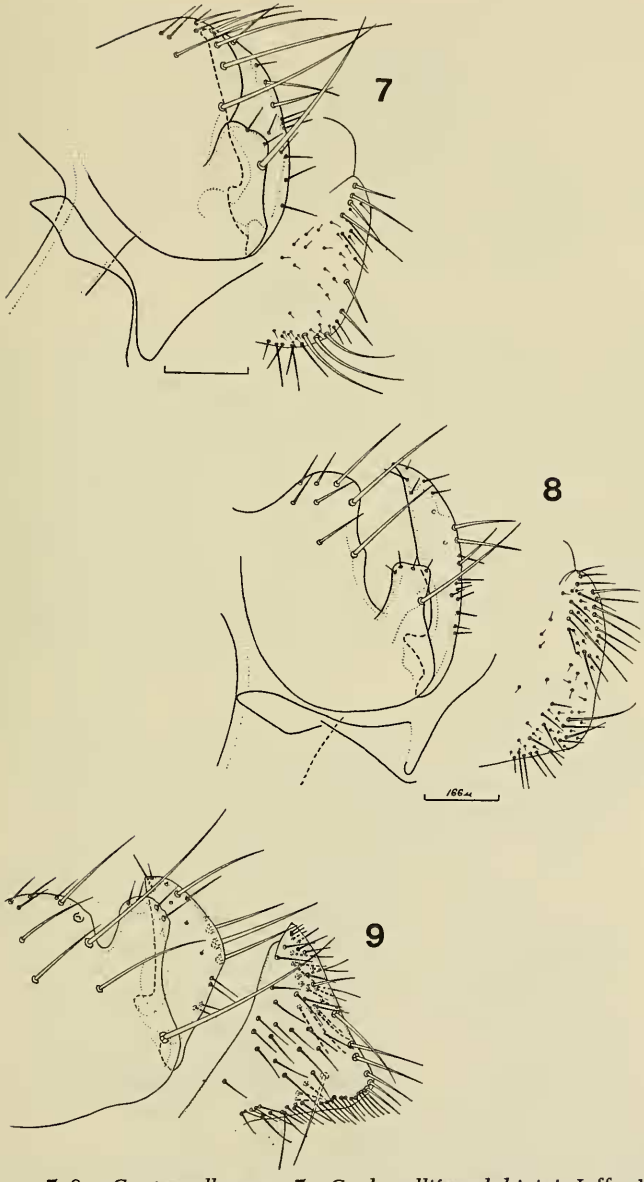
Abdomen—All unmodified abdominal tergites and sternites with but one row of setae. Setae on tergites I to VII in males: 5 (5–6), 7 (6–8), 6–7, 6 (6–7), 6 (5–7), 6 (5–6), 5 (4–6); females: 5 (5–6), 7 (6–9), 7 (6–8), 7 (6–8), 7 (5–8), 6 (5–7), 6 (4–6). Setae on sternites II to VIII in males: 1, 3 (2–4), 3 (2–3), 3 (2–3), 3 (2–3), 3 (2–4), 6 (5–8); on sternites II to VII in females: 1, 4 (3–5), 3 (3–5), 3 (2–5), 3–4, 6 (5–7). Males possess a patch of 2 to 5 small setae well up on the side of sternite II while in females there may be from 5 to 10 of these. In some cases they form a vertical row extending from the ventral margin about two-thirds the height of the sternite. Antesensilial setae two per side in both sexes, borne on a tuberculate projection of tergum VII, subequal, the lower seta 2½ times as long as the upper. Modified abdominal segments of holotype male and allotype female as shown in Figs. 2 and 3, respectively.

Length: ♂ 1.7 to 2.5 mm; ♀ 2.5 to 3.5 mm.

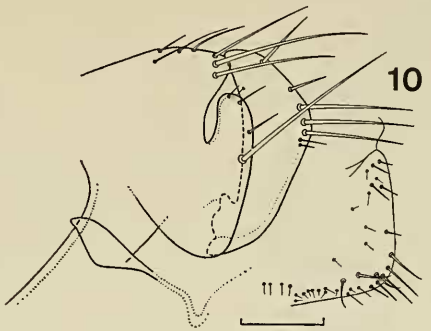
Types: Holotype ♂, allotype ♀ and 2 male and 1 female paratypes, Saudi Arabia: 5 km SSE Badanah, from *Meriones libycus syrius* nest, 24 Dec. 1962. Paratypes as follows: 1♂ and 4♀♀ ex *Vulpes rueppelli*, 40 km W Badanah, 27 Dec. 1962; 1♂ ex *Meriones crassus crassus*, Badanah, 27 Dec. 1961; 1♂ ex *Jaculus jaculus*, 15 km W Badanah, 28 Dec. 1961; 1♂ and 1♀ ex *Meriones libycus syrius* nest, 5 km SSE Badanah, 26 Dec. 1962; 1♀ ex *Meriones c. crassus*, Badanah, 26 Dec. 1962; 1♂ ex *Vulpes rueppelli*, 40 km W Badanah, 28 Dec. 1962; 1♀ ex *Gerbillus cheesmani*, 5 km W Turaif, 4 Jan. 1963; 2♂♂ ex *Meriones c. crassus*, Rafha, 20 Dec. 1962; 3♀♀ ex *Gerbillus dasyurus*, 8 km W Rafha, 21 Dec. 1962 and 2♀♀ ex *Meriones tristrami kariateni*, Palmyra, Syria, 13 Jan. 1962.

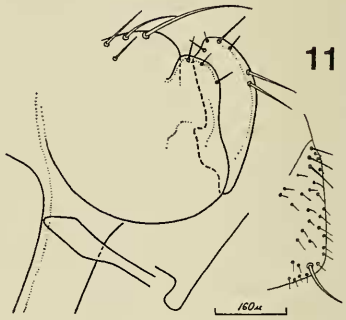
Holotype, allotype and two male and two female paratypes deposited in the British Museum (Natural History) collection of fleas at Tring. Paratypes in the collections of the United States National Museum, Washington, D.C.; Dr. Robert Traub, Bethesda, Maryland; and the Anti-Plague Institute of the Caucasus, Stavropol, U.S.S.R.

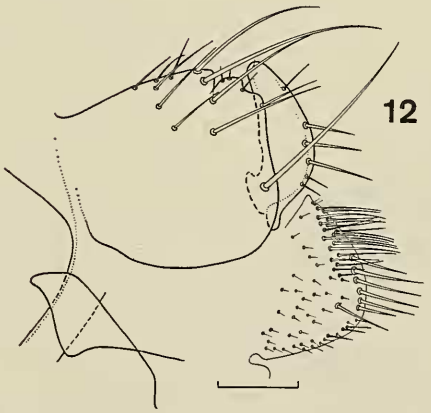
Remarks: *Coptopsylla joannae* appears to be a fairly common flea associated with the rodent populations of north-central Arabia. Collection



Figs. 7–9. *Coptopsylla* sp. 7, *C. lamellifer dubinini* Ioff, 1950, redrawn from Ioff, 1953. 8, *C. arax* Isayeva-Gurvich, 1950, redrawn from Isayeva, 1956. 9, *C. smiti* Hubbard, 1956, redrawn in modified form from photocopy of original by F. G. A. M. Smit.







Figs. 10–12. *Coptopsylla* sp. 10, *C. bondari* Ioff, 1946, redrawn from Ioff, 1953. 11, *C. caucasica* Isayeva-Gurvich, 1950, redrawn from Isayeva, 1956. 12, *C. bairamaliensis* Wagner, 1928, redrawn from Ioff, 1953.

records are not sufficient to supply much information about its general distribution but it probably occurs throughout the stony desert and desert steppe region of Syria, Jordan, northern Arabia and possibly western Iraq. The occurrence of the rather distantly related *C. smiti* Hubbard (1956) in Iraq suggests that more collecting in the desert and semidesert portions of the Middle East may yield additional members of this genus.

The new species described above is named in honor of my wife, Joanne, whose tireless efforts both in the field and in the laboratory have been of priceless assistance to me.

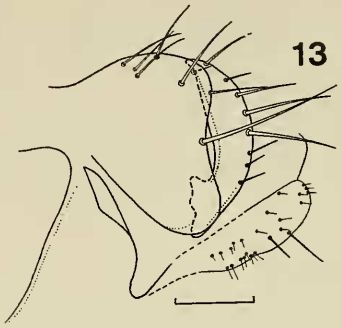
Discussion

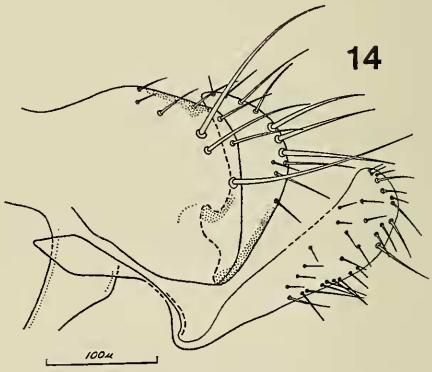
It is certainly not practical to attempt a revision of the genus *Coptopsylla* at this time, because of the limited number of specimens available for study. Hopkins and Rothschild (1956) give a total of 33 specimens in the collection of the British Museum (Natural History) representing but seven of the nine species and subspecies in the Catalogue. Even now there are but 52 specimens in the collection representing ten of the 16 known species and subspecies.

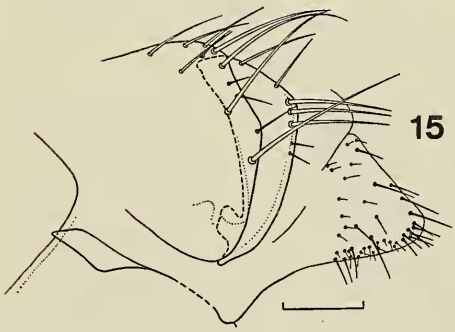
Due to the difficulty of obtaining Russian literature, the work of Ioff (1953) was not available for consideration when the Catalogue was prepared. Ioff's work lists 13 species and subspecies and is by far the most comprehensive consideration of the genus to date. Given below is a comparison of the listings given in these two works.

Ioff, 1953:		Hopkins and Rothschild, 1956:
C. lamellifer lamellifer (Wagner, 1895)		*C. lamellifer lamellifer*
C. lamellifer rostrata Ioff & Tiflov, 1934		*C. lamellifer rostrata*
C. lamellifer fallax Ioff & Tiflov, 1934	=	*C. lamellifer ardua* J. & R., 1915
C. lamellifer dubinini Ioff, 1950		
C. lamellifer arax Isayeva-Gurvich, 1950		
C. bondari Ioff, 1946		*C. bondari*
C. bairamaliensis Wagner, 1928		*C. bairamaliensis*
C. olgae Argyropulo, 1946		*C. olgae*
C. trigona Ioff, 1946		*C. trigona*
C. caucasica Isayeva-Gurvich, 1950		
C. africana Wagner, 1932		*C. africana*
C. macrophthalma Ioff, 1950		
C. wassiliewi (Wagner, 1932)		*C. wassiliewi*

The species *C. lamellifer dubinini, arax, caucasica* and *macrophthalma* are not included in Hopkins and Rothschild (1956) even though they were described six years earlier. Although not all of the original descriptions are available to me, Ioff (1953) figures *C. lamellifer dubinini* and *C. macrophthalma* and good figures of *C. arax* and *C. caucasica* may be







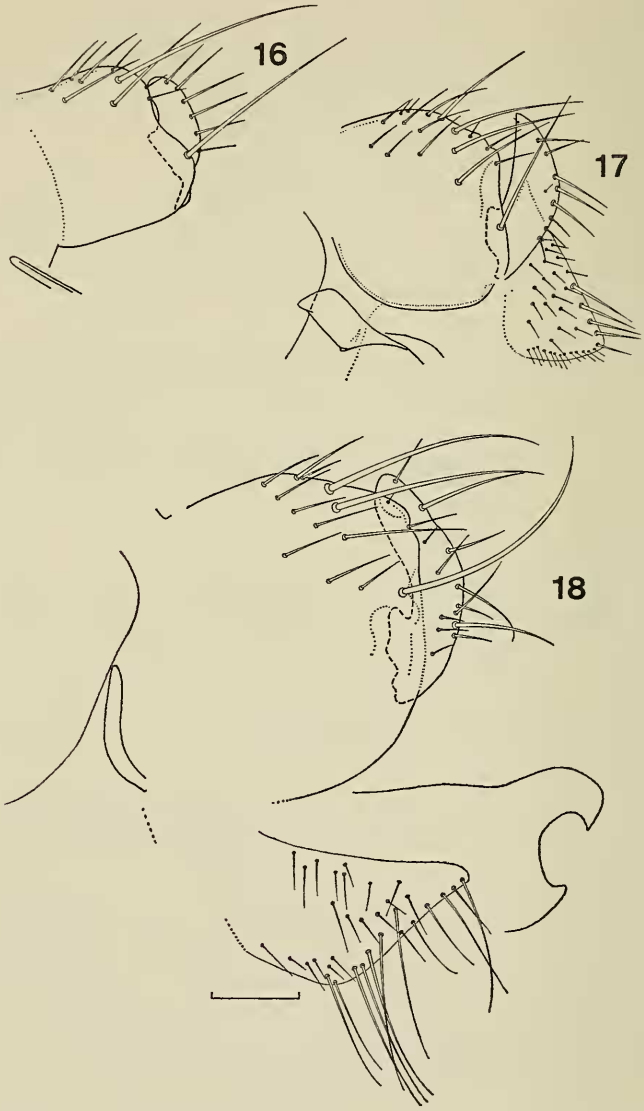
FIGS. 13–15. *Coptopsylla* sp. 13, *C. olgae olgae* Argyropulo, 1946, redrawn from Ioff, 1953. 14, *C. olgae wachschi* Labunets and Kafarskaya, 1961, redrawn from Labunets and Kafarskaya, 1961. 15, *C. trigona* Ioff, 1946, redrawn from Ioff, 1953.

found in a paper by Isayeva (1956) in which she states that figures for these two forms were previously lacking or unsatisfactory.

Hubbard (1956) described *C. smiti* from *Gerbillus dasyurus dasyurus* collected in Baghdad, Iraq. Labunets and Kafarskaya (1961) described *C. olgae wachschi* from *Meriones libycus erythrourus* collected in western Tadzikistan. These, plus the species described above, bring to 16 the recognized species and subspecies of the genus.

The following is an attempt to integrate the species and subspecies not listed by Hopkins and Rothschild (1956) into the system established by them in their treatment of the genus. Except for the drawings of *C. joannae* all of the illustrations are redrawn from the sources cited. The key is a modification of that of Hopkins and Rothschild (1956).

1. Tarsi with only 5 pairs of lateral bristles on segment V (sometimes only 4 on hind tarsus); female with the two antesensilial bristles of each side of almost equal size (North Africa) ..... *wassiliewi* (Fig. 16)
   Tarsi with 6 pairs of lateral bristles on segment V; usually one of the antesensilial bristles on each side much smaller than the other 2
2. Males 3
   Females* 17
3. Apex of movable process of clasper obtuse, having a distinct (though rounded-off) posterior angle ..... *bairamaliensis* (Fig. 12)
   Apex of movable process without such a conspicuous posterior angle, more or less acute 4
4. Body of clasper conspicuously dorsally divided by a deep and narrow sinus into two lobes (L^1 and L^2) 5
   Margin of body of clasper slightly divided into two lobes or slightly concave 11
5. L^1 of body of the clasper acuminate, directed caudally, movable process extending beyond apex of L^2 by about one-fifth its length ..... *bondari* (Fig. 10)
   Not as above 6
6. Movable process subtriangular, extending to, but not beyond, the apex of L^2 (Iraq) ..... *smiti* (Fig. 9)
   Movable process elongate, two-fifths or more extending beyond the apex of L^2 7
7. Acetabular bristle absent ..... *l. lamellifer* (Fig. 4)
   Acetabular bristle present 8
8. Conspicuous tubercle present on anterior margin of movable process 9
   Anterior margin of movable process undulate but lacking tubercle 10
9. Movable process of clasper over four times as long as broad, the tubercle on its anterior margin below the middle ..... *l. rostrata* (Fig. 5)



Figs. 16–18. *Coptopsylla* sp. 16, *C. wassiliewi* (Wagner, 1932) redrawn in modified form from Wagner, 1932. 17, *C. africana* Wagner, 1932, redrawn in modified form from Wagner, 1932. 18, *C. macrophthalma* Ioff, 1950, redrawn from Ioff, 1953.

Movable process little more than thrice as long as broad, the tubercle above the middle ..... *l. ardua* (Fig. 6)

10. L^1 of body of the clasper rounded, the sinus between L^1 and L^2 narrow ..... *l. dubinini* (Fig. 7)

L^1 of body of the clasper obtuse, its posterior margin sinuate, the sinus between L^1 and L^2 wide ..... *arax* (Fig. 8)

11. Margin of body of the clasper slightly divided into two lobes 12

Margin of body of the clasper entire, at most slightly concave 13

12. Acetabular seta absent, movable process ovoid, with blunt apex, about three times as long as wide ..... *caucasica* (Fig. 11)

Acetabular seta present, movable process triangular, with sharp apex, about two and one-half times as long as wide (Middle East) ..... *joannae* (Fig. 2)

13. Posterior margin of body of the clasper with a distinct concavity above the articulation of the movable process, sternum IX elongate, not subtriangular ..... *o. olgae* (Fig. 13)

Posterior margin of body of the clasper without such a distinct concavity above the articulation of the movable process 14

14. Sternum IX elongate, not subtriangular or distinctly triangular ..... *o. wachschi* (Fig. 14)

Sternum IX subtriangular or distinctly triangular 15

15. Movable process elongate, not triangular, its apex blunt ..... *macrophthalma* (Fig. 18)

Movable process triangular or subtriangular, its apex sharp 16

16. Posterior margin of body of the clasper with rounded hump in middle, acetabular seta arising considerably above the point of articulation of the movable process, apex of movable process extending two-fifths of its length past caudal angle in posterior margin of body of the clasper (USSR) ..... *trigona* (Fig. 15)

Posterior margin of body of the clasper straight, vertical, dorsal margin sloping caudally, acetabular seta arising over point of articulation of movable process (North Africa) ..... *africana* (Fig. 17)

17. Bulga of spermathecae merging gradually into hilla 18

Transition between bulga and hilla of the spermathecae abrupt 19

18. Hilla of spermathecae with distinct papilla at apex, caudal margin of St. VII with distinct concavity bordered ventrally by pronounced lobe extending to ventral margin ..... *caucasica* (Fig. 23)

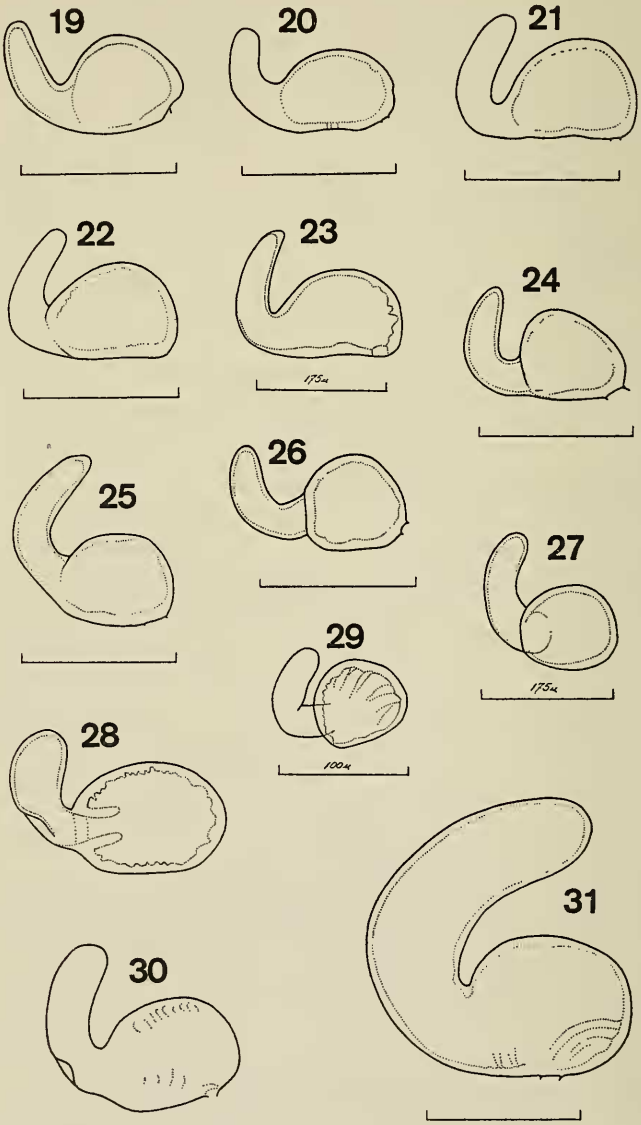
Hilla of spermathecae lacking apical papilla, lobe of St. VII not extending to ventral margin ..... *lamellifer* ssp. (Figs. 19–22)

19. Hilla of spermathecae obviously longer than their bulgae 20

Bulga and hilla of spermathecae about equal in size 22

20. Hilla of spermathecae twice as long as bulga ..... *macrophthalma* (Fig. 31)

Hilla of spermathecae less than twice as long as bulga 21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21. Bulga of spermathecae ovoid, longer than high ..... *bairamaliensis* (Fig. 25)
    Bulga of spermathecae spherical as long but not longer than high (Middle East) ..... *joannae* (Fig. 3)
22. Bulga of spermathecae strongly triangular ..... *bondari* (Fig. 24)
    Bulga of spermathecae not strongly triangular 23
23. Bulga of spermathecae obviously longer than high (North Africa) ..... *africana* (Fig. 30)
    Bulga of spermathecae not much if any longer than high 24
24. Ventral wall of bulga of spermathecae flattened, bulging much less than dorsal wall ..... *olgae* ssp. (Figs. 26, 29)
    Ventral and dorsal walls of spermathecae about equally curved ..... *arax* (Fig. 27)

* Females of *smiti* and *trigona* are unknown.

A point should be made concerning the status of *Coptopsylla arax* and *Coptopsylla caucasica*. Although Ioff (1953) considered *arax* to be a subspecies of *C. lamellifer*, Isayeva (1956) gives it specific rank. Judging from the degree of modification of the genital segments of the male, this course appears to be justified. However, the illustration of the spermatheca of *C. arax* was made from a specimen in which this organ was turned and thus does not show its true profile. It is difficult to ignore the similarity between the shape of the spermatheca in *C. caucasica* and *C. lamellifer* ssp. I would, therefore, suggest the possibility that the drawings of the spermathecae of *C. arax* and *C. caucasica* were somehow switched during the preparation of the paper and that actually the drawing of the spermatheca of *C. caucasica* is that of *C. arax*. If this is true, the relationship of *arax* to the *lamellifer* subspecies is quite close.

I wish to acknowledge the many kindnesses extended by Mr. F. G. A. M. Smit of the British Museum (Natural History) at Tring, Herts., without whose assistance this work could not have been completed.

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Figs. 19–31. *Coptopsylla* sp. 19–22, *C. lamellifer* ssp., redrawn from Ioff, 1953. 23, *C. caucasica* Isayeva-Gurvich, 1950, redrawn from Isayeva, 1956. 24, *C. bondari* Ioff, 1946, redrawn from Ioff, 1953. 25, *C. bairamaliensis* Wagner, 1928, redrawn from Ioff, 1953. 26, *C. olgae olgae* Argyropulo, 1946, redrawn from Ioff, 1953. 27, *C. arax* Isayeva-Gurvich, 1950, redrawn from Isayeva, 1956. 28, *C. wassiliewi* (Wagner, 1932) drawn from Pl. 12*a*, Hopkins and Rothschild, 1956. 29, *C. olgae wachschi* Labunets and Kafarskaya, 1961, redrawn from Labunets and Kafarskaya, 1961. 30, *C. africana* Wagner, 1932, redrawn from Wagner, 1932. 31, *C. macrophthalma* Ioff, 1950, redrawn from Ioff, 1953.

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